be exhibited in the School of Mines in Paris of specimens of the strata obtained from the Mont Cenis Tunnel. This collection, which consisted originally of only 127 specimens, has received 69 new specimens, which brings the total number to 196 altogether.

The total vertical thickness of the strata explored was more than 7,000 metres. The general colour is grey, or, rather, black, and the colouring matter is mostly carbon. Very few fossils were met with, having been destroyed by the subsequent crystallisation.

The disturbances which have created Mont Cenis and made it emerge from the bottom of the sea have produced many cracks and faults. But all these faults have been filled up with quartz in a perfect manner in relatively modern times. The infiltration amounts practically to nothing. The only spring which was discovered is situated near Modane, and gives only seven gallons per minute. The water is cold. The contractors were obliged to send to Modane and Bardonnèche for the water required for drinking, and for grinding the stone.

Mont Blanc, although 4,800 metres above the level of the sea, is only 3,500 above its own base. The vertical section of the perforated strata is thus equal to two Mont Blancs; and it is something like one whole Himalaya. M. Sismonda, Professor of Geology at Turin, presented to the Royal Academy of Sciences, Turin, in the sitting of the 5th of December, 1866, a paper entitled *Nuove osservazioni geologiche sulle rocce anthracitifere delle Alpi*, at the end of which was printed a map drawn by M. Sismonda twenty-five years ago, and exhibiting the theoretical succession of strata. Everything was found in the place where it was supposed to be by M. Sismonda.

No artesian well has ever given an opportunity of comparison with the perforation of Mont Cenis, as the deepest bored by European engineers is only 1,000 metres, and by the Chinese only 3,000 metres.

The Academy listened during more than an hour to the lecturer. M. Faye presented to the learned Perpetual Secretary the hearty thanks of the Academy, and expressed a wish that a series of pendulum experiments should be conducted on the top of Mont Cenis as well as in the central part of the tunnel, to test the effect of the mass of the mountain on the time of the oscillations.

NOTES

We believe that the stations to be occupied by the Eclipse Expedition are Baikul, Gunote, and Manantoddy, near the Malabar coast; Poodoocottah, near Trichinopoly; and Jaffa, in Ceylon. These arrangements are necessitated by the information received as to the weather chances from the Viceroy of India and the Governor of Ceylon, who are taking the warmest interest in the intended operations. It is hoped that Prof. Stokes will take charge of the Expedition, and in this hope we venture to join very warmly. As our leading physicist, as Secretary of the Royal Society and potential President, as one who has so closely studied solar physics and the methods of attack contemplated—on each and all of these accounts it is obviously for the advantage of science that the Expedition should be under his command. The Committee has communicated by telegram with Prof. Peirce, expressing a hope that the Expedition may be strengthened by the addition of some American observers who are all veterans in eclipse matters. Prof. Respighi has also been invited to accompany the party. We must not omit to add that Lord Lindsay has supplied the Committee with many valuable instruments, and is aiding in other ways.

Dr. Carpenter arrived at Malta in the *Shearwater* last week, and has been engaged in conjunction with Captain Nares, commanding that vessel, in a series of researches on the Gibraltar current, intended to complete the inquiries made last year in the *Porcupine*. The existence of the outward undercurrent, which was indicated by the experiments of last autumn, has now been conclusively demonstrated. Dr. Carpenter will accompany the *Shearwater* to Egypt for the purpose of prosecuting in the eastern basin of the Mediterranean the physical and zoological inquiries which he carried on last year in the western basin.

Mr. Hind informs us that on Friday night last he secured observations of an extremely faint nebulosity, which he believes will prove to be Encke's Comet, though the predicted time of perihelion may be eight or nine hours too late.

September 22 at $11^{h}\ 37^{m}\ 21^{s}$ Twickenham M.T.
☄ R.A. . . . . . . $1^{h}\ 58^{m}\ 45^{s}\cdot9$
☄ Decl. . . . . . . $+31^{\circ}\ 22'\ 1''$

This position depends on comparison with one of Bessel's stars extending over more than an hour, during which motion in the right direction for Encke was apparent. Though very faint, it is hardly more so than Mr. Hind expected to find it from previous experience. We may look for a fine telescopic object in November, and one just visible to the naked eye after the middle of the month and in the first days of December, before it gets too near the sun's place to be observable.

The College of Physical Science at Newcastle-on-Tyne has issued the prospectus of its first session, to open October 7. The following is the programme of studies:—Prof. Aldis will conduct three classes in Mathematics; two for junior students, and one for any who may enter with sufficient knowledge to enable them at once to take up subjects which will in future be ordinarily read by students in their second year. There will also be an Exercise class for all the students. In Experimental Physics, Prof. Herschel will have two classes; the advanced class will contain experimental illustrations of Practical Mechanics, and of Heat considered especially with reference to its application in mining, manufactures, and to the steam-engine; but there appears to be no provision for practical laboratory work. In Chemistry, Prof. Freire-Marreco will conduct both the course of lectures and the practical course in the laboratory. Prof. Page will deliver a course of lectures on Geology, and will accompany the students in field excursions or visits to museums. As yet there is no immediate prospect of a chair of Biology, though we understand its creation is a settled thing as soon as funds allow. The medical degrees at Durham University can now be taken without residence, but an additional year must in that case be made at Newcastle. The College has taken off the hands of the College of Medicine the new lecture room, built expressly for Chemistry and Physics, and the laboratories.

The Chargé d'Affaires of the Japanese Government in this country, who has looked with longing eyes on Messrs. Cooke's great equatorial, the gem of the present International Exhibition, should also inspect some meteorological instruments for transmission to Japan. The following extract from a little illustrated news-sheet now being hawked about Yedo, giving an account of the late typhoon in the inland sea, and a picture of the appearance of Kobe Bay after it, will show that the Japanese have as yet quite elementary notions in meteorological science:—"The Great Storm-Wave in Kishiu, Idzumi and Setsu.—The sudden changes and movements of heaven and earth are caused by the commingling of the female and male elements, and the contention of wind and rain. Alas! not even can the influence of the gods of Buddah prevail to govern them. It was on the night of the 18th day of the fifth month of the fourth (goat) year of Meiji, and about ten o'clock, that the wind and rain became exceedingly violent, and a great storm-wave arising, not only the steamers, but also about 700,000 large and small boats were thrown ashore at Kinohana and Kumanoura in Kishiu, at Sakai, and at Tempozan off Osaka. At the frightful destruction, old and young, males and females, wept and howled; and the sound thereof was most pitiable. The number of the dead was in proportion to the size of the places (visited by the storm). It was a wonderful event, not heard of in former generations. On the following morning the rain ceased, and the mad wind became quiet, and then for the first time men felt at ease in their heart."

WE have to record the death, in his seventy-ninth year, of the Rev. William Hincks, F.L.S., for many years Professor of Natural History and Director of the Museum in University College, Toronto, and previously Professor of Natural History in the Queen's College, Cork. Mr. Hincks, who had but just resigned his professorship owing to the infirmities of age, was an accomplished and enthusiastic botanist, and had also devoted much attention to certain departments of zoology. He possessed a wide range of scientific knowledge, and through a long life had done much for the diffusion of scientific tastes and culture. Almost to the very close of life he was an enthusiastic student, actively engaged in pursuing his favourite researches, and alive to all that was passing in the scientific world. He published many papers on natural history and other subjects, some of which were specially devoted to the Fauna and Flora of Canada, chiefly in the "Journal of the Canadian Institute." To the Museum connected with University College, of which he was the director, he devoted much time and labour, and rendered it very valuable service. He was an active member of the Canadian Institute, and one of the Editing Committee, which is charged with the publication of the "Journal." In 1869 he was elected president, and was re-elected the following year.

MR. SAMUEL SOLLY, F.R.S., expired suddenly on Sunday last. Mr. Solly was deservedly well known from his numerous contributions to the advancement of science, especially by his work on the "Human Brain," "Surgical Experiences," an "Analysis of Müller on the Glands," and by his various papers and lectures on surgery in the medical journals.

A GERMAN translation of Mr. E. B. Tylor's "Primitive Culture" is in progress. Dr. Spengel is the translator, and the publishers Winter and Co. of Leipzig.

OUR old friend *Cosmos*, the publication of which has been suspended since September last, reappeared on the 10th inst. in a new form, under the title of *La France Scientifique*, still edited by M. Victor Meunier. The new journal takes for its motto, "Régénérer la France par la Science, et la Science par la Liberté." The three numbers already received contain articles original and selected on science and education.

Les Mondes for September 23rd contains an account of an invention by M. Corbin, a sugar manufacturer of Lizy-sur-Ourcq, of a portable railway, which can be laid down daily in any position, and can be used for facilitating agricultural operations, causing a great reduction in the amount of labour required. The invention could evidently be applied only in the case of farms consisting of very large fields, as occurs in some parts of the East of England.

THE Zoological Society of London have just received a fine living example of a species of Cassowary new to their collection. It is a young bird, but is probably referable to the *Casuarius uniappendiculatus*, described some years ago by Mr. Blyth from a specimen observed alive in Calcutta, although there are at present no traces of the single throat-wattle, from which the species obtained its name. In general appearance the new acquisition resembles the Mooruk or Bennett's Cassowary (*C. Bennettii*) rather than the Common Cassowary of Ceram (*C. galeatus*). It is said to have been captured on the coast of New Guinea, near the Bay of Geelvink, and was, we believe, obtained by the Zoological Society from one of the sister institutions of the Continent.

IN reference to our article last week on the Smithsonian Institution, we hear that quite recently the learned societies and public libraries of Holland have undertaken to co-operate with the Institution in this enterprise, by forming a Central Scientific Bureau of the Netherlands, at which the packages intended for transmission to America are to be collected, and forwarded from time to time to the Smithsonian Institution, which will distribute them to the parties addressed. The Bureau also proposes to establish special agencies in different parts of Europe, and has already announced the firm of MM. J. B. Baillière and Son, of Paris, as the agents for France, to whom all French institutions are requested to address such copies of their works as may be intended for the Netherlands.

WHEN ocean cables were first submerged, various apprehensions of probable injury were entertained, some of which have proved to be well founded, and others less so. It was supposed that worms or mollusks would burrow in the substance of the envelope, and ultimately penetrate to the centre of the wires; or, again, that the attachment of barnacles, mollusks, or other marine animals on the exterior would invite the attacks of the sharks, rays, and other fish of powerful jaws, and induce them to subject the bunch of matter to such a mastication as should produce serious harm to the cable. To what extent any accidents have happened from this source it is perhaps difficult to say; but we now learn from *Harper's Weekly* that the Florida cable between Punta Rosa and Key West has been injured in numerous places, as supposed by sea-turtles biting through or crushing it in their teeth, to such an extent as to destroy its continuity. It is, perhaps, a question whether the turtle be chargeable with these operations; and we think it is quite as probable that, under the circumstances, some ray or other fish has attacked it, and for the reasons already suggested.

A CORRESPONDENT requests us to state that the valuable specimens of *Stagonolepis Robertsoni* and other reptilian remains from the upper Elgin sandstones, which Prof. Huxley has lately examined, are to be found in the Elgin Museum, and not in that of Dundee, as mentioned in our last week's "Notes."

WITH reference to the earthquake recorded in our last number as having occurred in Chile and Peru in June last, a correspondent informs us, that being at that time in Madeira, a perceptible shock was felt there on the 20th about 6 P.M.

M. STROUMBO, a Professor in the University of Athens, has suggested the substitution for some scientific terms in ordinary use of others etymologically more correct. He proposes in particular saccharometer for saccharimeter, eidoloscope for kaleidoscope, rheumatometer for rheometer, rheumatostat for rheostat, apochrose for achromatism, phasmoscope for spectroscope.

AMONG recently started magazines deserving a word of commendation is *The Traveller*, a monthly international journal for England and America, devoted to international topics, real estate and agriculture, and to universal travel. It contains original articles by well-known writers on the various subjects included under the above headings, some of which are illustrated, reviews, notes and queries, correspondence, &c., of a character calculated to interest a variety of readers; and the price at which it is published brings it within the reach of all.

PART II. vol. ii. of the "Transactions of the Entomological Society of New South Wales" is occupied by the first portion of a description, by Mr. Macleay, of a collection of over 1,100 Coleoptera, brought from Gayndah a town on the Burnett River in that colony. Many of both genera and species are new. In this paper Mr. Macleay makes an innovation which he thus refers to in his introductory remarks:—"I have always hitherto, in describing new genera and species, adopted the system most usual with English entomologists of giving these descriptions in Latin. On this occasion I intend to depart from that rule, as I believe that many of those who take an interest in Australian entomology will infinitely prefer the descriptions given in plain and intelligible English."

THREE important papers are reprinted by Mr. V. Ball, from the *Journal of the Asiatic Society of Bengal*—"Notes on the Geology of the Vicinity of Port Blair, Andaman Islands;" "Notes on Birds observed in the neighbourhood of Port Blair during the month of August, 1869;" and "Brief Notes on the Geology and on the Fauna in the neighbourhood of Naucowry Harbour, Nicobar Island."

THERE has been issued, under the auspices of the Accident Insurance Company, an admirable little manual of instruction for the prompt treatment of accidents and emergencies, by Mr Alfred Smee, the eminent surgeon. It is clear, comprehensive, and portable, and the reader is guided in the more important curative processes to which it relates by well-executed and instructive woodcut illustrations.

"HUMAN Locomotion, how We Stand, Walk, and Run," is the title of a lecture delivered last December at Cornell University, by Prof. B. G. Wilder. Dr. Wilder's lecture was profusely illustrated by diagrams and interesting practical experiments. Among other matters he noticed the curious fact that a person never goes in a perfectly straight line for any distance, but always turns to one side or the other, and at last describes a circle and returns to the point from where he started. The deflection is generally if not always from right to left, and is accounted for on the principle that one side of the body tends to outwalk the other. It is a received opinion among American hunters and woodmen that people who lose themselves in forests or extensive plains thus travel in a circle turning to the left.

WE have received a pamphlet on the Economical Production of Peat and Peat Charcoal, as carried on at the works of the Peat Engineering Company, Redmoss, near Bolton, Lancashire. The peat is extracted from the bog, macerated, and moulded by machinery. It is also transformed into a superior quality of charcoal. That the manufacture is a profitable one is apparent from the fact that an acre of peat bog of the average depth of ten feet, will yield sufficient to make a thousand tons of charcoal, which, in competition with wood charcoal, can be sold at such a profit as would alone produce the value of the land from which it is extracted. It is stated that in 1852 the actual annual consumption of raw and carbonised peat in France amounted to 359,319 tons, a consumption which has since largely increased.

THE *Revue Universelle* says that the German Confederation, in acquiring an extended frontier from France, has traced it, not upon a topographical plan, but, in all probability, on a geological map edited at Berlin. In fact, it is to be observed that the new boundaries between France and Germany absorb, for the benefit of the Confederation, all the rich deposits of the mines of oolitic iron in the basins of the Moselle and the Meurthe, with the exception of the Longwy group. Save this, which has been reserved, Germany has made herself mistress of the major portion of the best part of the most important mineral beds in France. These beds extend under the vast plateau which forms the east of the departments of Moselle and Meurthe, and crop out in the valleys from Longwy, in the north, as far as Pont-Saint-Vincent (Meurthe), in the south, and comprise a full quarter of the mineral riches of France. The new determination of frontier will have the effect of introducing into the productive industry of Germany, according to the statistics of 1867, "twenty-three blast furnaces, producing 205,000 tons of metal; 9,000 hectares of iron country, yielding 500,000 tons of ore; fourteen works manufacturing 127,000 tons of iron; and 22,000 hectares of coalfield concessions, yielding 180,000 tons of coal."

THE Maharajah of Bhurtpore has established workshops in which steam is the motive power for the industrial instruction of his people.

ON THE STUDY OF SCIENCE IN SCHOOLS*

BEFORE we commence our regular and systematic study of science, I wish to say a few words to all of you who will hereafter take part in these studies, concerning the nature and character of experimental science, and certain matters connected with the pursuit of it. It will be well to discuss these subjects under the following headings:—

Firstly. The rise and growth of the sciences we are about to study, and their distinguishing features.

Secondly. The objects and aims of the experimental sciences, and the reasons why we study them.

Thirdly. The methods we shall follow for the acquirement of a knowledge of science.

Fourthly. The attitude of mind most favourable to such studies.

As to the first of these divisions, I may mention that the boundary lines of the experimental sciences are very clearly defined. For we find at the extreme limit in one direction the mathematical sciences, mathematical astronomy, mathematical mechanics, and so on; and at the other extremity the classificatory sciences: zoology, botany, and so on. Our course lies between the two limits, where we find the physical sciences proper: statics, dynamics, mechanics, hydrostatics, hydrodynamics, pneumatics, acoustics, heat, light, magnetism, electricity. Chemistry is usually distinguished from these, both on account of the magnitude of the science, which necessitates separate and distinct treatises, and because it concerns the intimate structure or composition of matter, while the physical sciences proper are concerned with unaltered matter. But the term experimental sciences includes both the physical sciences and chemistry, and is hence the most convenient for our purpose.

Most of the physical sciences partake somewhat of the character of the mathematical sciences, while chemistry is on the verge of the mathematical sciences. The physical sciences relate rather to dead matter, to inorganic, unorganised matter, while the classificatory sciences relate to organised living matter: the former to the mineral kingdom (as it used to be called), the latter to the animal and vegetable kingdoms.

Although isolated facts belonging to many of the sciences were known to the ancients, no science can be said to have existed in anything like a complete form for more than 200 years, and several of them are less than a century old. The science of *Statics* treats of the balance of forces, of the relation of the various forces which act upon solid matter at rest. The derivation of the name from ἵστημι is sufficiently obvious. The science commenced with Archimedes (who lived in the third century B.C.), and was greatly developed by Galileo, Bernouilli, and Lagrange. When the equilibrium of fluids is discussed, it is called *Hydrostatics* (from ὕδωρ), and the equilibrium of gases is described under the head of *Pneumatics* (πνέυμα). Hydrostatics owes its origin to Archimedes; you will remember the story of his weighing the crown of impure gold in water, and detecting the imposture; and thus arose that which to this day is called the "law of Archimedes," which asserts that when a body is immersed in a liquid, it loses a portion of its weight equal to the weight of the liquid which it displaces. Stevinus of Bruges, who wrote in the sixteenth century, and Pascal contributed much to the advancement of this science. The reverse of rest is motion, thus there are sciences relating to the motion of solids, liquids, and gases. *Dynamics* (δύναμις) treats of the motion of solid bodies, and of the relation of the forces which produce motion. It originated as a science with Leonardo da Vinci, who, besides being the greatest painter of his day, was an eminent mathematician, engineer, musician, and natural philosopher. He showed that if two forces are represented in magnitude and direction by the two sides of a parallelogram, the resultant is represented by the diagonal of the parallelogram. This is the important principle of the "parallelogram of forces." Galileo added the laws regarding falling bodies; while Newton and Huyghens investigate the laws which regulate centrifugal forces. *Hydrodynamics* treats of the motion of fluids, and bears the same relation to dynamics that hydrostatics bears to statics. The motion of gases is discussed under the science of pneumatics; we have no sciences of pneumastatics and pneumadynamics. Pneumatics dates from the discovery of Torricelli in 1642 that the air possesses weight. Eight years later, Otto von Guericke, of Magdeburg, invented the air-pump, and the science was then developed with great

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* A Lecture delivered at Marlborough College as an introduction to the commencement of Science teaching, by G. F. Rodwell.